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No 6

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No 6

This is a serial publication containing selected translations on the fuel, electric power, mining, metallurgical, and construction materials industries in Eastern Europe.

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## CZECHOSLOVAKIA

### DEVELOPMENT OF THE INDUSTRY OF FUELS AND CHEMICAL PROCESSING OF PETROLEUM UNTIL THE YEAR 1980

Following is the translation of an article by B. Valdauf  
in Ropa a uhlie (Petroleum and Coal), Vol 3, No 2,  
Bratislava, Feb 1961, pages 33-34.

While the Third Five-Year Plan is creating material and cultural reserves for a gradual transition to communism, the purpose of the long-term plan of development until 1980 is to create conditions for continuity with the Third Five-Year Plan and build the foundations of a communist society. Through its 80% growth in comparison with the year 1960, the chemical industry will in 1965 become one of the essential industries of the national economy. The rate of development will keep increasing, and in 1980 it will be 4.5 times larger than in 1965. Especially expanded will be the production of plastic materials, namely 12 times, production of synthetic fibers -- 8.5 times, production of synthetic rubber -- 8.5 times, and production of combustibles -- 2.5 times.

This great increase in the production of combustibles, organic compounds and products of the chemical processing of petroleum requires proper supply of raw material. Owing to considerable investment and operational costs it is not feasible to use for the above purpose only coal; the output of petroleum, on the other hand, is not sufficiently high to become the base of the outlined development. The lignite and coal tars will represent only 7% of liquid hydrocarbons and the extracted petroleum 1.5% while the production will achieve a quadruple of its present volume.

The part of the main raw material base will be played by petroleum which will probably be imported from the USSR in amounts exceeding by five times those of the year 1965. We therefore have to count upon processing sulfonic paraffinic petroleum.

Petroleum will serve as a raw material for production of combustibles, lubricants, asphalts and greases, will be a raw material for the industry of petro-chemical syntheses and will participate in securing combustible oils for the power facilities. The plans presuppose the processing of 33% of the petroleum into combustibles, lubricants and asphalts, 20% in production of basic raw materials and petro-chemical syntheses, and 43% for the needs of the power industry.

Unlike the Third Five-Year Plan in which production of combustibles from tars amounted to 10%, further plans do not consider this type of production. All combustibles will be manufactured from petroleum. In the

individual products the following increases in comparison with the year 1965, is presupposed: automobile gasoline -- 4.8 times more; diesel oil -- 2.6 times; asphalts -- approximately 7 times, and oils -- approximately 1.7 times more.

A relatively higher increase in production of gasoline indicates that the proportion between the consumption of automobile gasoline and that of diesel oil has improved while the disproportion which will present itself between 1961 and 1965 will be removed that way that a part of trucks will be transformed to use gasoline and the number of automobiles will go up. The growth in production of the other products is proportionate to the growth of mechanization equipment in agriculture, the construction industry and other sectors, and to the growth of consumption in railroad and highway transportation.

It will also be necessary to obtain permanently optimal qualities. In carburetor engines it is quite clear today, even though increased compression ratios are contemplated, that this increase has its limits and that for the optimal compression ratio an octane number between 90 and 100, established by means of a research method, will be required. In diesel oil it will be necessary to search for more advantageous technological processes than deparaffinization with urea in order to reduce its point of solidification, or perhaps look for more effective admixtures to modify the point of solidification. Also in production of lubricating oils we have to secure better quality through suitable technological processes and with the use of refining admixtures. A problem which will have to be solved is the production and distribution of inexpensive combustible oils of low viscosity and with a low content of sulfuric compounds.

Petroleum will be processed in large plants designed for this purpose, with an optimum capacity with regard to the size of the individual technological units technically attainable and with regard to the distribution of the combustible fuels and oils. The optimal capacity will be calculated by means of the Soviet computer, Model "Ural", by which the objectivity of the technological parameters will be secured.

Much more complex are the prospects in chemical production based on petroleum. It will be necessary to select for the main products in question an economically suitable raw material base with the simplest technological process.

For instance, the aromatic hydrocarbons benzene, toluene and xylene will be obtained primarily from raw benzol, from which by hydrogenation and subsequent distillation it is possible to obtain pure hydrocarbons; phenols and aromatic compounds from lignite tars; acetylene from natural gas by oxygen fission -- and the main raw materials ethylene, propylene,  $C_4$  fraction, isopentane, cyclohexane, heptene fraction and higher paraffins from petroleum, mostly benzene and gaseous fractions, from plants which process petroleum.

The expansion of chemical production which processes petroleum is given by the growth of production of the plastic materials and paints, synthetic fibers, synthetic rubber and superficially active materials. What an increase is expected is indicated by the ten-fold increase in

production of ethylene and propylene in 1980 in comparison with 1965.

For production of aromatic hydrocarbons, our basis of coal and lignite tars will be insufficient, and the aromatic compounds will have to be produced on the basis of petroleum, and probably it will be necessary to apply the technological processes for extracting benzene and toluene from higher aromatic compounds. By using benzine for production of raw materials for chemical manufacturing processes, its budget surpluses will be liquidated and a number of studies will be accepted in order to ascertain the most economical way to utilize these benzine fractions and to what extent it will be advantageous to use benzine in larger quantities also for gasification.

It is expected that most of the petro-chemical processes will be attached to petroleum-processing plants, or plants which process natural gas or coke-works gas. A great productivity of work will be obtained by using large basic units built at huge combines, with application of the greatest possible automation. Only thus will great productivity of work be obtained, which will be the main indicator for securing the desired development.

Not less important are the problems of transportation and storage of the combustible fuels and oils. In the first place it will be the adoption of pipeline transportation of petroleum to the works processing petroleum, located in the center of the areas where combustible fuels and oils are consumed. The selection of distribution was made for the reason that at the present time it is not expected that combustible oils could be transported otherwise than in tank cars, whereas combustible fuels can be distributed by pipelines. It will consequently be necessary, owing to the fact that such big volumes of petroleum, combustible fuels and oils will be handled, to present a complex solution of the problem of processing petroleum so that at the same time conditions be created for an economic development of petroleum products, either from mineral oil refineries or from a part of those plants in which petroleum is processed chemically.

Even though this rough and approximate conception is the first variant of a long-term plan which will be subjected to considerable alterations, it places before us big tasks in the fuel and petro-chemical industries. The entire development of our chemical sector, the production of plastic materials, synthetic fibers, synthetic rubber, and the process of improvement of our material and cultural standard depend on how soon the economic processing of this principal raw material, essential for the development of production of the basic chemical materials, will be secured. Plastic materials produced the chemical way must replace non-ferrous metals and iron, and wool and cotton must be replaced by the chemically produced artificial fibers. Our national economy will then be most efficient and the capitalist countries will be surpassed, not only with regard to the per capita consumption, but also with regard to the effectiveness of production. This is the only way to build a communist society in the shortest possible time.



## CZECHOSLOVAKIA

### HOW TO ECONOMIZE ON ENERGY

[Following is the translation of an unsigned article in Uhli (Coal), Vol III, No 3, Prague, March 1961, pages 73-74, 102]

The plants of the Ministry of Fuel and Energy are the main producers of energy for our national economy. These plants, along with cooperatives, supply the major part of the energy, and the coal mine electric power plants produce more than 94 percent of the total electric power output. We are also a great consumer, because our mines, in producing electric power and heat consume approximately 20 percent of the coal supply. On this basis, we try to influence the coal consumption which exceeds the 20 percent consumed by the electric power plants. It is necessary, therefore, that we consider ways of economizing on the sources of energy, and on the energy produced in our socialist republic.

As far as the power economy was concerned, we tried, during the first and second Five-Year Plans, to concentrate almost exclusively on upgrading production and increasing the electric power output. In coal mining we belong among the most advanced countries, and our per capita output in tons of fuel value is at the level of that of the most industrialized countries, and in brown coal we are second in the world. In hard coal output we hold eighth place. We also have the largest annual expansion in coal production in the world. In comparison with the developed capitalist countries, England, West Germany, and the US, for example, where the coal output is stagnating or has been falling off for years, there is quite a difference.

So far we have devoted little time to the solution of the problems of our energy economy through economizing on the energy which is hidden in the coal we produce. The efficiency of our boilers is low, our rail transportation is still largely steam powered, in households only about 12 percent have central heating, and only about 17 percent of households have gas. The technology of the final consumer products is reflected in the standards of the measurable quantities of fuel, heat, and electricity expended per unit of production. Here, for the time being, in view of the degree of development of the economy of our country, we do not occupy the place we ought to in comparison with the industrially developed capitalist states. In 1955, for example, the German Federal Republic consumed on the average 21 percent less of measurable fuel, 36 percent less of heat, and eight percent less of electric power than we did in the same year. This means that with the same amount of consumed energy, the German Federal Republic produced just about one third

more than we did. The socialist administration sets up the standards for overcoming these lacks and the most advanced of the capitalist states in this area and it is necessary that we take full advantage of all these opportunities.

In view of the total energy supply worked out as a part of the perspective plan of our national economy up to the year 1980 and ahead, based on the so-far computed final total, showed that we shall have to pay more attention to the energy economy in the years ahead. In comparison with the other states, we have discovered that our primary sources of energy are relatively limited. On the basis of present research, the supplies of classical fuels in tons of measurable fuel with a heat-producing capacity of 7,000 kcal/kg produce are one third of the world's and European average per inhabitant. Per km<sup>2</sup>, however, it is almost double the world's average, but again only about one third of the European average. To a certain extent this is also caused by the fact that while brown coal, with lignite, amounts to less than 10% of the overall supply of coal in the world and in Europe, in our country it reaches approximately 50% of the coal supply, expressed in tons of measurable fuel. According to present statistics, the supply of petroleum and natural gas is quite limited. Also the use of water power plays quite an insignificant role in our overall resources.

The use of energy in our country is growing at a considerably rate which fact is merely in harmony with the rapidly growing industrial and agricultural production and with the growing standard of living of our population. Brown coal, which so far remains the basic raw material source of energy of our national economy will not be sufficient in the coming era of rising needs. For the time being, we wish to point out that in 1965 approximately 16% of the consumed energy will have to be imported, either as energy or as fuel. By 1980 the need of energy imports will grow to approximately 38%. For this reason and also due to the fact that the Soviet Union has offered us long-range deliveries of petroleum, the rapid decrease of the share of the directly burned fuels from 46% in 1960 to 20% in 1975 is a significant indication of our long-range energy supply. Another indication is the considerable decrease of the share of stable fuels, which today form 85% of our resources and in 1980 will drop to about 58%. In proportion to this, the consumption of liquid fuel is growing.

All types of black coal, appropriate for the production of coke, will be used to produce coke, which is the basis of the development of our coal production and whose supply by us helps the development of the mining industry in some friendly people's democracies. For this reason, in our total energy supply, black coal will be distributed only from the coal-fields of Kladno, Trutnov, Plzen and Rosice and in the OKR /Ostravsko-Karvinsky revir -- The Ostrava-Karvina Coalfields/ only as interest payments, refinery products and similarly.

The advance results of the planned energy supplies show that we have to make a basic change in the distribution of the energy at our disposal. In a relatively short time we shall have to undertake measures intended to use up all of the coal supply in question and its

careful distribution with the least possible amount of waste and especially such measures that provide for an outstanding increase in the usefulness of industrial heating furnaces, a considerable lowering of the shares to locally-heated households, planning electrification of rails and introducing diesel-electric locomotives.

A number of these measures will have to be initiated directly by the fuel sector. In coal mining, it will first of all be necessary to prepare a changeover to a blasting method of mining in the SHR /Stredocesky hnédouhelny revir -- The Central-Bohemia brown coal fields/ to great and so far unusual depths and use up even the old bank fields wherever considerable supplies of coal remain. Some suggestions on this point have already been presented. It will be necessary to work to prepare these projects and especially the development of the appropriate types of machinery that would permit the economical mining of veins down to 300-450 m in depth. The changeover to a full blasting mining system will help to lower the losses of coal supplies considerably, which, with the chamber system in great veins, makes over 50% of the overall quantity of coal and as a result increases the usable amount of coal supply.

In the surface and underground mines we shall have to mine all the exposed coal carefully and avoid the usual losses in fallins. It will be necessary to pay more attention to judging the approachability of the veins, and in the smaller coalfields increase productivity considerably, which by far does not approach the output of our principal Ostrava-Karvina coal fields.

Coal will have to be processed more carefully than up to this time so that the consumer gets his fuel in the most refined form possible. It will furthermore be necessary to improve the water disposal of washed coal and extinguished coke, exploit the possibility of dryers that operate on superfluous heat, increase the yield of refineries more systematically and use the waste type of fuel. We shall strive to use the methane by product more than previously by making extensive installations of degasing equipment and using the gas thus obtained.

Besides the coal mining and refining measures which we shall have to undertake on our own power in the mines and refineries and which depend on us alone, just like all of the consumers of coal and heat and electric power, we shall have to take measures to lower our own energy consumption.

As far as the direct decrease of fuel consumption is concerned, it will first of all be the case of continuing in the electrification of transportation in the surface mines. Uneconomic steam transportation uses thousands of tons of fuel yearly at the rate of 8-12%. Electrification of mine transportation in the surface mines has already been begun. Today plants and coal fields themselves demand that the deliveries of electric locomotives from our machinery factories, especially electric locomotives of 900 mm gauge, be speeded up. In connection with this, it is necessary to note that the changeover to an electric track, as it is realized in our surface coal fields, is an excellent example of what happens if we do not foresee a sufficiently advanced direction of technological development or if we make our decisions late, and at the same time we see the type of

damage caused when our machinery industry is unable to adapt quickly to great and basic changes in technology. This has reached such proportions that a whole row of brand new BS 200 steam locomotives sits unused.

Beside the locomotive transportation in the surface mines, the direct supply of fuel in the mine sector is shared equally by a number of mine installations, especially the smaller and older ones that are equipped with steam mining machinery, possibly steam compressors and such. And it is just in these small and older plants that the economy of the heating operation is largely on a very low level. Before us lies the task of either gradually reconstructing and modernizing the existing steam operations, or their full electrification based on the life-expectancy of the mine and according to the investment load.

The same situation exists in the old factory electric plants. Only a few of these are still in operating condition. However, their economy is always considerably lower than the existing economy in the electric plants.

It is also necessary to dwell on order in the boiler rooms of our modern dwellings, of which there are many located in our coal fields. We have had good experience in some coal fields in the organization of competitions among the furnace men to work for the greatest of economy in the operation of boiler rooms. This competition needs to be extended and intensified further.

So far we have not mastered the use of the sources of extra heat that exist in some of our coal fields. Many a time we have heard the suggestion to set up hothouses in such cases and grow early vegetables, which would certainly be quite welcomed, especially in the new residential areas, and which would contribute to the increased standard of living of our workers.

The fuel sector is also one of the most significant consumers of electric power. Our share of the state consumption has been fluctuating around 10% in the last few years. That is why it is our duty to put our consumption of electric power to good use.

It is impossible to say that we are satisfied with the way we use our electric power. The specific consumption of electric power is high and in the majority of the coal fields it continues to grow.

The lowering of the specific consumption of electric power is not in contrast with the requirements of full mechanization and electrification of mining, which is an inseparable link in the completion of the building of socialism in our country. Specific consumption is on the whole large, and the natural growth of the consumption of electric power as a result of the development of mechanization and electrification is only a small part of that which can be and must be saved in the consumption of electric power.

The greatest source of reserves in the consumption of electric power is the change from compressed air operations to electrically operated mining machinery and equipment and the removal of mining locomotives using compressed air. The use of compressed air engines is at least six times less economical, so that the reserves that can be obtained by the introduction of electrification are great. Nevertheless, the coal

fields, especially in the OKR, continue to build further compressors, and the overall and specific consumption of compressed air continues to grow. First of all, it is unquestionably necessary to dwell on safety and decidedly not introduce electrification at the expense of safety in the mines.

Wherever adequate ventilation has not been introduced with regard to the existing mining safety precautions dealing with the installation of electricity, electricity should not be installed. However, in the majority of the cases it is well within our power to take such precautions and thus insure the installations of the planned electrification.

In the OKR, electrification has progressed so far that steps should be taken to liquidate compressed air on the individual levels at this time. Combined operations whenever the same level has both electricity and compressed air has the worst possible economy of operation, primarily due to the fact that the disposal of compressed air along the level entails great losses and forces the crews to improve ventilation by releasing this compressed air. It is then necessary to take a further qualitative step, and, after opening and preparing the level, to do away with compressed air and adopt fully electric operation.

The fact remains that to realize these resolutions we lack a few of the mechanical needs and electrical equipment that in many a case hinder the realization of the changeover to full electrification and elimination of compressed air on the individual levels. The task of research and machinery plants is to develop and produce quickly these missing links in full electrification.

First of all there is a lack of power hammers that would not have to depend on the deliveries of compressed air from the compressors above ground and on the long distribution lines for compressed air through the shaft to the front. Here electric hammers would be the best thing; however, nowhere in the world are they powerful enough.

It will therefore be necessary to conduct an intensive search for other appropriate and possibly combined solutions.

Furthermore it is necessary to develop and produce noncombustible electric lute SIC ventilators according to the requirements, especially the combination air and electric ventilators, since by their continuous operation lute ventilators are the greatest consumers of compressed air in the shafts. It is also necessary to develop electric loaders which could be handled as easily as the air loaders. Today such a task is already fully practicable since hydraulic drive links are at our disposal.

Finally one of the prerequisites of full electrification is the beginning of production of new, modern electric instruments because the existing machinery no longer fits modern demands, is of old design, and very large and heavy. Finally the machinery industry must comply with the just complaints of our miners and technicians and produce machinery on the highest existing technological level.

In conclusion, we would once more like to underline the importance and urgency of the tasks that stem from the planned total of available energy. Our mines, machine shops and coke plants, and also our research institutes, planning organizations and development plants have important

tasks in supplying the necessary implements to secure the further rapid development of the national economy of our socialist republic and the standard of living of our people. It is necessary that we solve these problems in a satisfactory manner today and soon reach a high technological level both in production and in consumption.

## CZECHOSLOVAK ECONOMIC BRIEFS

### LIST OF CZECHOSLOVAK PETROLEUM PRODUCTS -- GROUPS F 111

Petroleum Ether. Petroleum ether is a light benzine fraction with a limited distillation extent and a specified degree of purity.

Its types and application:

Petroleum ether is manufactured in one form and serves as a volatile solvent for laboratory purposes.

Appearance and general properties:

Petroleum ether is a clear, colorless and non-fluorescent liquid, soluble in any proportion in pure alcohol, ether, chloroform, benzene, and oils (excluding castor oil).

#### Required quality:

Product	Petroleum ether HP 200-003-54
Color	Clear, colorless, non-fluorescent. 0.680
Density at 20°, maximum	
Distillation test:	
beginning of distillation, °C not below end	30
of distillation, °C not above	70
Reaction of the released residuum to litmus paper	neutral
Test for organic substances with sulfuric acid	It is permissible that H <sub>2</sub> SO <sub>4</sub> get a slightly yellow shade, but its volume should not change conspicuously
Test for sulphites and reducing substances	Negative (water layer should not turn brown)
Residuum after evaporation by water bath, mg/20g -- maximum	1
Spontaneous evaporation on filter paper	Must not give strange odor or leave greasy stains

(Bratislava, Ropa a uhlie, Vol 3, No 2, Feb 1961,  
insert between pages 48-49)

## OUTLINE OF CERTAIN SELECTED CZECHOSLOVAK STATE STANDARDS

The following is an outline of certain selected Czechoslovak State Standards, changes and additions in force in the sector of standardization of petroleum products, their testing, lubrication and related operations. The Outline is taken from the List of CSN in force -- State as of 1 January 1960 (Seznam platnych CSN -- stav k 1. lednu 1960), the additions and public notices announced in publications of the Publishing House of the Bureau of Standardization until December 1960.

Kindly check the standards that you use, especially their titles and the year of publication which is given always on the title page of each CSN /Československa Statni Norma -- Czechoslovak State Standard/ in the first box of the lower frame.

CSN Number	Title	Year of Publication
01 00..	Lists and regulations regarding standards	
01 0011	Formation, records and announcement of technical conditions (formerly of 1953)	1959
01 27..	Colorimetry	
01 2720	Color marking of sources of danger and safety devices	1956
01 2725	Directives for color modification of work environment	1960
01 59..		
01 5907	Marking of places of lubrication	1960
13 67..	Armatures	
13 6708	Assembling of cisterns and tanks for combustible fuels and oils	1960
34 10..	Regulations for electric installations	
34 1030	Regulations for installing electrical instruments appliances and lamps	
34 14..	Regulations for electrical equipment in areas exposed to hazards of explosion	
34 1400	Electrical engineering regulations of the CSN, part XIV. Electrical equipment in mines and places containing flammable materials subject to explosion (formerly CSN ESC, part XIV)	1955
34 3190	Instructions for workers on how to handle electrical equipment at industrial plants -- in revision	1953
34 64..	Insulators -- tests of cast insulators	
34 6431	electrical stability	1954
34 6432	Electrical tests of liquid insulators	
	Electrical stability of insulating oils (CSN ESC 8 from the year 1950, article 3.13)	1959



CSN Number	Title	Year of Publication
34 6435	Inner insulation resistance	1954
34 6441	Loss coefficient tg and dielectric constant E	1954
34 6460	Tests of electric insulating materials. Electric resistance of insulating materials (formerly CSN 64 0160, 64 0160, 64 0161 of the year 1953 and CSN ESC 8, article 3.14 of the year 1950) (Bratislava, Ropa a uhlie, Vol 3, No 2, Feb 1961, insert between pages 48-49).	1959